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## NEW HAMPSHIRE DIVISION OF HISTORICAL RESOURCES

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### **STATEMENT OF SIGNIFICANCE CAVENDER ROAD BRIDGE HANCOCK-GREENFIELD, NEW HAMPSHIRE**

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#### **Summary:**

The Cavender Road Bridge is one of two bridges of its type remaining in New Hampshire. It is a pin-connected low Pratt truss. Once a common type of truss for bridges on small streams, pin-connected Pratt trusses have become exceedingly rare because they were generally designed for horse-drawn traffic and have been replaced as automobiles and motor trucks have imposed heavier loads and greater impacts on bridges. The Cavender Road Bridge represents an important chapter in the history of American engineering as well as an important chapter in the history of transportation in New Hampshire.

#### **History:**

The Cavender Road Bridge was built in 1906 by the Groton Bridge Company of Groton, New York. The bridge was a joint enterprise of the towns of Hancock and Greenfield. Each town paid \$433, half the cost of the span.

The Contoocook River had had a bridge at this location since 1780. In 1863, the two towns built a low truss bridge to replace the original structure, a simple span of wooden stringers or horizontal beams, probably supported by a pier in the middle of the stream. The new structure was a wooden span similar to the present bridge in its low proportions and lack of overhead connections between its two side trusses. The two wooden trusses were sheathed with boards to protect them from damage from rain.

The present bridge represents a once-common design for small spans. The Groton Bridge Company, which maintained an eastern district office in Fitchburg, Massachusetts, undoubtedly built many such structures throughout the northeastern United States, but today we know of only four spans that this company erected in New Hampshire.

## Engineering Significance:

The Pratt truss was designed and patented in 1844 as a combination wood and iron bridge. It never became highly popular until wrought iron began to be used in the 1880s to replace wooden or partly-wooden trusses. By the 1890s, steel had replaced wrought iron as a bridge material, and the Pratt truss quickly achieved dominance in bridge design.

In the early years of the twentieth century, steel Pratt truss bridges outnumbered every other truss design used in the United States, and may have outnumbered all other truss designs combined. Today, because of continual replacement, low Pratt trusses have become rare.

The joints of the Cavender Road Bridge are connected with steel pins rather than by riveted gusset plates. Pin-connected steel bridges were common in the late 1800s and early 1900s, but only a few remain in New Hampshire.

The use of pinned connections for bridge building reflects the development of structural engineering. Prior to the mid-1800s, bridge builders designed their spans largely by intuition developed from long experience. The efforts of a few scientific engineers slowly made it possible to calculate the precise stresses in each part of a bridge truss. This permitted a bridge to be designed to bear a specific load--its "design loading"--and for each component of the truss to be proportioned to bear the stresses created by that load.

When engineers design trusses, they simplify their initial calculations by assuming that every joint in the truss will be connected by a pin, and that the connections of each piece can move slightly to keep the component aligned with the compressive or tensile forces imposed upon it by the weight of the bridge and the weight of traffic. In bridges with riveted connections, this ideal design is compromised by the rigid joints. But in pin-connected trusses, the finished bridge actually reflects the ideal design and performs accordingly.

Thus, the now-rare pin-connected truss may be said to represent the purest and least compromised form of bridge design. Because the finished bridge functioned exactly as intended in the original design, the pin-connected truss allowed precise engineering calculations to be incorporated into the finished span without the need for highly complex mathematics.

Because pin-connected bridges were often designed for the relatively light highway loads and low speeds associated with horse-drawn traffic, and because the components of these trusses were precisely proportioned for their design loading, short pin-connected spans are among the lightest and most delicate of all steel bridges. These structures have an almost web-like quality that makes them among the most aesthetically attractive of all metal bridges. The logic and simplicity of their design makes them especially appealing to engineers and to historians of engineering.

## Historical Significance:

The Cavender Road Bridge is one of the last survivors in New Hampshire of a major early campaign to improve highways and bridges. Called the "Good Roads" movement, this campaign began in the 1880s and continues today under the auspices of the national Good Roads Association.

The purpose of the Good Roads movement in its early years, as today, was to ensure that American roads were adequate to do get people and goods from place to place. In New Hampshire, much concern was expressed over the fact that local farms were in decline and could not be made successful unless farmers could get their produce to market--usually, to a railroad depot. Similarly, the great quantities of second-growth timber that were growing in abandoned pastures were looked upon as an untapped economic asset, but an asset that had no value unless logs could be transported to sawmills and boards transported from mill to market.

The early Good Roads movement took the form of a widespread campaign to convince towns to appoint knowledgeable road agents, to buy the machinery necessary to repair deteriorated gravel roads, and to replace bridges of insufficient load-bearing capacity with new ones, usually of steel, with the ability to bear much heavier loads. The State of New Hampshire aided this process by creating the State Highway Department in 1903 and by offering a program of state-funded bridge aid to ease the local burden of replacing deficient bridges. The state bridge aid program continues today.

Thus, the Cavender Road Bridge embodies important chapters in both the history of American engineering and the history of American transportation. While New Hampshire once had many such small, improved steel truss bridges, only a handful remain today. As others have disappeared, the importance of the Cavender Road span has increased. Today, the bridge is of statewide importance, and was declared eligible for listing in the National Register of Historic Places in 1982 because it "is associated with the development of a regional transportation network and embodies the distinctive characteristics of the pin-connected pony [low] truss bridge."